Bio-inspired problems: wake generation and body interaction of marine animals.

Report by: Chao An, Che-Wei Chang, Diego Muriel

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Motivation:
Dabiri ([1]) explains the concept of optimal vortex formation and its relevance to biological or bio-inspired systems, ranging from the human heart to underwater vehicles. He does experiments on jellyfish and shows that the optimal vortex can potentially serve as a unifying principle to achieve propulsion in nature and design engineered propulsions systems that are constrained by pressures unrelated to biology. In this experiment, we would like to examine the vortices generated by some other alive marine animals or engineer appendage and investigate their interaction with the animal.

Methodology:
We would probably put an alive animal in a small tank (e.g., 1m by 1m) and measure the wakes behind it. If alive animals are difficult to handle since they travel randomly in water, we will use some engineer appendage instead (e.g., paddle-like plexiglass to mimic a fish tail). Techniques used to do measurements will include PIV and LIF.

References